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EXAMINER	
WANG, CHUN CHENG	

ART UNIT	PAPER NUMBER
1796	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/586,979	IVERSEN ET AL.	
	Examiner	Art Unit	
	Chun-Cheng Wang	1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 108-164* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,108,109,111-153,155,160-162 and 164* is/are rejected.

7)☒ Claim(s) *110, 154, 156-159 and 163* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 July 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *See Continuation Sheet*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :10/26/2006, 03/12/2007, 04/15/2008, 09/11/2008, 09/09/2009.

DETAILED ACTION

1. Claims 2-107 have been cancelled. Claims 1 and 108-164 are pending.

Claim Objections

2. Claim 143 is objected to because of the following informalities:

Claim 143: A Markush-type claim recites alternatives in a format such as "selected from the group **consisting of** A, B **and** C.", proper format is required if Applicants intended to claim under the Markush formula. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 111-122, 124, 125, 127, 130-135, 147, 148, 150-153, 155 and 162 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 111, 112, 114-116, 130-135, 147, 148, 155 and 162 contain the phrases "such as", "preferably" and "advantageously" render the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Claim 127: Water is used in parent claim 108 as a solvent, water could not be a co-solvent of water.

Claim 127: A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired.

See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim recites the broad recitation alcohol, and the claim also recites methanol, ethanol and isopropanol which are the narrower statement of the range/limitation.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1, 108 and 109 are rejected under 35 U.S.C. 102(b) as being anticipated by Gale et al. ("Organized Molecular Assemblies in the Gas Phase: Reverse Micelles and Microemulsions in Supercritical Fluids", Journal of American Chemical Society, 1987, 109, 920-921) (referenced as Gale hereinafter).

Gale discloses preparation of microemulsions of highly polar, colored azo dyes (malachite green [*p,p'-(p*phenylmethylidene) bis(N,N-dimethylaniline)] and methyl red [2- [p-(dimethylamino)phenyl]azo] benzoic acid] or a protein (cytochrome C) in supercritical fluids using supercritical fluid-AOT (surfactant)-water system. CO_2 supercritical fluid (compressed fluid) is examined (left column, page 920). Gale also discloses at higher densities a single micelle-containing phase is formed (read on controlling the density). As water is added to this phase, the micelles are "swollen" to sizes which accept the polar dyes (read on water core) (second paragraph, right column, page 920).

7. Claims 1, 108 , 109, 123, 126-138, 144-147, 149, 160-162 and 164 are rejected under 35 U.S.C. 102(b) as being anticipated by Ji et al. ("Synthesizing and Dispersing Silver Nanoparticles in a Water-in-Supercritical Carbon Dioxide Microemulsion", Journal of American Chemical Society, 1999, 121, 2631-2632) (referenced as Ji hereinafter).

Claims 1, 108 and 109: Ji discloses preparation of silver nanoparticles in a water-in-supercritical carbon dioxide microemulsion (title) by using surfactants or cosurfactants with fluorinated tails provides a layer of a weakly attractive compound covering the highly attractive droplet (e.g. water) cores (first paragraph, left column, page 2631).

Claim 123: See caption of Figure 1, page 2632.

Claims 126 and 127: Ethanol is added to the microemulsion (second paragraph, left column, page 2632).

Claims 128 and 129: See surfactant system in paragraph 3, right column of page 2631.

Claim 130: The disclosure of Ji is adequately set forth above and is incorporated herein by reference. The perfluoropolyether-phosphate ether is soluble in CO_2 and would inherently have HLB of less than 15.

Alternatively, Ji is silent on the HLB of the surfactant(s). It is known that complete water solubility occurs at an HLB of about 7. Surfactants with HLB values above this mark are completely miscible with water, while those below this value are only partially soluble in water. The perfluoropolyether-phosphate ether is soluble in CO_2 (third paragraph, right column, page 2631). It is obvious to one ordinary skilled in the art would recognize the perfluoropolyether-phosphate ether has the claimed surfactant HLB of less than 15.

Claim 131: The surfactant system consisted of a mixture of sodium bis(2-ethylhexyl)sulfosuccinate ([AOT] = 12.8 mM) with a fluorinated cosurfactant, a perfluoropolyether-phosphate ether ([PFPE-PO4] = 25.3 mM) at a water-to-surfactant ratio of W = $[H_2O]/[AOT]$ = 12 (third paragraph, right column, page 2631). The $[H_2O]$ is 0.1536 M (= $[AOT]x12 = 12.8x10^{-3}x12$). The water concentration can be calculated as 0.063 wt. % (18x0.1536/molecular weight of CO_2 44).

Claim 132: Ji disclose a water-to-surfactant ratio of $W = [H_2O]/[AOT]$ = 12 (third paragraph, right column, page 2631).

Claim 133: The molar ratio of compressed surfactant to the dissolved or dispersed molecules in water is 38.79 ([AOT] = 12.8 mM (third paragraph, right column, page 2631) and [AgNO3] = 0.33 mM (first paragraph, left column, page 2632)).

Claims 134-136: See caption of Figure 1, page 2632.

Claims 137, 138, 160 and 161: The Ag particle is extracted by RESS technique using PEEK restrictor (second paragraph, right column, page 2632).

Claims 144-147: See reduction reaction in second paragraph, left column, of page 2632. Silver nanoparticles having diameters from 5 to 15 nm are produced (first paragraph, left column, page 2631).

Claim 149: The precursor solution and the final Ag-particle solution contained optically clear microemulsions during the entirety of the reaction sequence (read on controlled temperature and pressure) (second paragraph, left column, page 2632).

Claim 162: the silver nanoparticles are deposited on a specimen holder for TEM analysis (See Figure 2, page 2632).

Claim 164: See paragraph 3, right column in page 2631.

8. Claims 1, 108 , 109, 128-137, 144-146, 149 and 164 are rejected under 35 U.S.C. 102(b) as being anticipated by Johnston et al. ("Water-in-Carbon Dioxide Microemulsion: An Environment for Hydrophiles including Proteins", Science, Vol. 271, 2 February 1996, page 624-626) (referenced as Johnston hereinafter).

Claims 1, 108 and 109: Johnston discloses preparation of aqueous microemulsion droplets in a carbon dioxide (in supercritical fluid state)-continuous phase with a surfactant (Abstract). BSA-Ac is solubilized within the aqueous microemulsion droplets (fourth paragraph, page 625). Johnston also discloses loss in CO_2 density and hence in solvent strength caused the solution to become turbid (i.e. water droplet aggregation, read on control of density to water core size) (fifth paragraph, page 624).

Claims 128 and 129: The ammonium carboxylate perfluoropolyether surfactant (paragraph 4, page 624) has a CO_2-philic portion and a CO_2-phobic portion.

Claim 130: The disclosure of Johnston is adequately set forth above and is incorporated herein by reference. The ammonium carboxylate perfluoropolyether surfactant is soluble in CO_2 and would inherently have HLB of less than 15.

Alternatively, Johnston is silent on the HLB of the surfactant(s). It is known that complete water solubility occurs at an HLB of about 7. Surfactants with HLB values above this mark are completely miscible with water, while those below this value are only partially soluble in water. The ammonium carboxylate perfluoropolyether is soluble in CO_2. It is obvious to one ordinary skilled in the art would recognize the ammonium carboxylate perfluoropolyether has the claimed surfactant HLB of less than 15.

Claim 131: The concentration of water is 0.48 weight % (paragraph 5, page 624).

Claim 132: The molar ratio of water to surfactant 14 (paragraph 5, page 624).

Claim 133: There are 9% (e.g. 9 mM) of 100 nM BSA-Ac (Note 20. page 626) encapsulated in PFPE microemulsion (paragraph 4, page 625). The calculated PFPE concentration is about 15.3 mM (weight of PFPE in 1 L (758 g, calculated from the CO_2 density of 0.758 g/ml from Table 1)) of the microemulsion is 10.612 g (=1.4 % (Note 20, page 626) x 758g) divided by PFPE molecular weight 695. The molar ratio of the surfactant to the dissolved molecules is 1.7.

Claims 134-136 and 149: See Table 1.

Claim 137: See Abstract.

Claims 144-146: See reaction of 4-hydroxy-TEMPD within the polar microemulsion core (paragraph 2, page 626).

Claim 164: See paragraph 5, page 624.

9. Claims 1, 108 , 109, 123, 126-130, 134-138 and 164 are rejected under 35 U.S.C. 102(b) as being anticipated by Lee et al. ("Water-in-Carbon Dioxide Emulsion: Formation and Stability", Langmuir, 1999, 15, 6781-6791) (referenced as Lee hereinafter).

Claims 1, 108 and 109: Lee discloses preparation of stable water-in-carbon dioxide (W/C) emulsions (microemulsion of droplet size 3 to 7 μm (3rd paragraph, page 6785)), for supercritical CO_2 containing water, are formed with various molecular weight perfluoropolyether ammonium carboxylate surfactants. A decrease in CO_2 density causes an inversion to C/W emulsions (read on control of CO_2 density) (Abstract). Water, salt, surfactant and ethanol are loaded into pressurized vessel (Emulsion Formation and Stability section, page 6783).

Claim 123: See the re-circulation loop for homogenization (Figure 2., page 6783).

Claims 126 and 127: Cosolvent ethanol is used (Emulsion Formation and Stability section, page 6783).

Claims 128 and 129: The stable water-in-carbon dioxide microemulsion is prepared by using various molecular weight perfluoropolyether ammonium carboxylate surfactants (Emulsion Formation and Stability section, page 6783) having CO2-philic portion and CO2-phobic portion.

Claim 130: Lee discloses PFPE-NH_4 surfactants with molecular weights of 940 and greater have low solubilities in water and are very soluble in CO_2, resulting in low HCB values (see Table 1) and the formation of W/C emulsions at high pressures. However, PFPE-NH_4 with a

molecular weight of 672 has a moderate solubility in water, which results in a higher HCB value and the formation of C/W emulsions. These HCB values are consistent with rules of thumb, namely W/O emulsifiers have HLB = 3-6, wetting agents have HLB = 7-9, and O/W emulsifiers have HLB = 8-18.

Claims 134-136: The system is operated at 35°C and 103.4 bars (second paragraph, page 6787).

Claims 137 and 138: Lee discloses dispersions of water-in-CO_2 on the nanometer (microemulsions) scale offer new possibilities for separations on the basis of polarity, and as media for reactions between polar and non-polar molecules (first paragraph, page 6781).

Claim 164: See Figure 2 in page 6783.

10. Claims 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Hei et al. (US 2004/0033269) (referred as Hei hereinafter).

Hei discloses preparation of antimicrobial compositions including a near critical or supercritical (densified) fluid and an antimicrobial agent (Abstract). The densified fluid antimicrobial composition can also include other ingredients, such as another fluid (e.g., water); solvent or cosolvent and a surfactant [0050]. The compositions are in the form of microemulsions [0055].

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

13. Claims 139-143, 147 and 148 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ji et al. ("Synthesizing and Dispersing Silver Nanoparticles in a Water-in-Supercritical Carbon Dioxide Microemulsion", Journal of American Chemical Society, 1999, 121, 2631-2632) in view of Ohde et al. ("Synthesizing silver halide nanoparticles in supercritical carbon dioxide utilizing a water-in-CO_2 microemulsion", The Royal Society of Chemistry, Chem. Commun, 2000, 2353-2354) (referenced as Ohde hereinafter).

The disclosure of Ji is adequately set forth in paragraph 7 and is incorporated herein by reference.

Ji is silent on two or more micro emulsions of different compositions in separate pressurized vessels are produced and combined.

Claim 139: Ohde discloses preparation of a water-in-CO_2 microemulsion for synthesizing silver halide nanoparticles in supercritical carbon dioxide (Title). Water, sodium bis(2-ethylhexyl) sulfosuccinate (AOT) and the cosurfactant perfluoropolyether phosphate (PFPE-PO_4); and supercritical carbon dioxide are placed in a pressurized vessel and stirred (paragraph 5, page 2353). Ohde also discloses ionic species stabilized in the water core of a water-in-CO_2

microemulsion in supercritical fluid CO_2; by mixing two microemulsions containing Ag^+ and X^- ions separately, silver halide (AgX) nanoparticles were synthesized in supercritical CO_2 (Abstract). Ohde also discloses formation of nanoparticles in supercritical fluids offers significant advantages over conventional liquid-phase systems including rapid separation of solvent and the possibility of depositing the particles *in situ* in porous materials utilizing the unique properties of the supercritical fluid phase.

In light of such advantages, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to produce two or more micro emulsions of different compositions in separate pressurized vessels and combine them to synthesize nanoparticles in supercritical CO_2 and have reasonable expectation to be successful.

Claim 140: Both Ji and Ohde discloses using surfactant system comprising sodium bis(2-ethylhexyl) sulfosuccinate (AOT) and the cosurfactant perfluoropolyether phosphate (PFPE-PO_4) to prepare the microemulsion.

Claims 141-143: Ji further discloses the cosurfactant (PFPE-PO_4) partitions into the interface region with the AOT, and the fluorinated tails reduce the interdroplet attractive interactions where the AOT microemulsion droplets can be stably dispersed (last paragraph of page 2631 through first paragraph of page 2632). Ohde also disclose rate of formation of silver nanoparticles in the water-in-supercritical CO_2 microemulsion is fast, suggesting the microemulsion is dynamic in nature. By collision, exchange of contents between two water-in-supercritical CO_2 microemulsions takes place effectively (first paragraph, page 2353).

Claims 147 and 148: Ohde discloses producing nanoparticles having diameter of 3-15 nm (third paragraph, page 2354) (a prima facie obviousness for the overlapping range with the claimed range of 1-10nm).

14. Claims 112, 118 and 120-122 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. ("Water-in-Carbon Dioxide Emulsion: Formation and Stability", Langmuir, 1999, 15, 6781-6791).

The disclosure of Lee is adequately set forth in paragraph 9 and is incorporated herein by reference.

Lee also discloses a homogenizer (Aveston, model C-5) was used to form the emulsions by pumping the bottom, water phase through a narrow-slit, adjustable homogenizing valve, and then back into the high-pressure cell (read on re-circulating fluid mixture). Homogenizing pressure was typically 10000-15000 psi. System temperature was controlled to within 0.1°C (see Emulsion Formation and Stability section, page 6783 and Figure 2 in page 6783)

Lee is silent on the volumetric re-circulation rate.

Increase of the volumetric re-circulation rate will increases fluid linear flow rate and thus increases shear rate for faster homogenization.

In light of the analysis, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains to perform routine experiment for desired speed of homogenization and obtain the claimed rate of re-circulation.

Claim 118: The fluid is sprayed through the narrow-slit (e.g. nozzle).

Claim 120: The fluid in the pressurized vessel is stirred, withdrawn from the pressurized vessel, fed to a homogenizer and re-circulated back to the pressurized vessel (Emulsion Formation and Stability section, page 6783).

Claim 121: The supercritical CO_2 can be fed through the circulating loop (Figure 2 in page 6783).

Claim 122: Water, salt, surfactant and ethanol are loaded into pressurized vessel and sealed (Emulsion Formation and Stability section, page 6783). Selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results, See In re Burhans, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

Allowable Subject Matter

15. Claims 110, 154, 156-159 and 163 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chun-Cheng Wang whose telephone number is (571)270-5459. The examiner can normally be reached on Monday to Friday w/alternate Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton Cano can be reached on (571)272-1398. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ling-Siu Choi/
Primary Examiner, Art Unit 1796

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Examiner, Art Unit 1796

/CCW/